

XX.—Notes from the Gatty Marine Laboratory, St. Andrews.
—No. XXXI. By Prof. M'INTOSH, M.D., LL.D.,
F.R.S., &c.

[Plates V. & VI.]

1. On a Young Stage of *Gadus luscus* with bold transverse bars of pigment.
2. On the British *Spionidæ*.
3. On the *Spionidæ* dredged by H.M.S. 'Porcupine' in 1869 and 1870.

On a Young Stage of Gadus luscus with bold transverse bars of pigment.

The example (Plate V. fig. 1), which measured 70 mm. in length, was thrown alive on the sand by a runlet of seawater near the Pole Rock, adjoining the West Sands, St. Andrews, on 3rd April, 1908, along with a young ling of $7\frac{1}{2}$ inches in the boldly banded condition. The young bib had a brownish-red colour with very distinct black bars, a coloration which, like that of the young cod, may be protective amongst the seaweeds and rocks. The dorsal surface of the head is covered with dark pigment, a pale band separating this from a dark band joining the upper border of each operculum. A broad dark belt passes downward below the interval between the 1st and 2nd dorsals to the ventral border; and the abdomen in front, almost to the opercular aperture, has a considerable amount of pigment. The most perfect band is a broad one which has its anterior border at the last third of the 2nd dorsal and passes with a slight slope backward to the base of the 1st anal. Its posterior edge is a little behind a line joining the intervals between the 2nd and 3rd dorsals and the anals. The last area of dark pigment occupies the region extending behind the 3rd dorsal and the 2nd anal to the base of the caudal rays. The dorsal and ventral edges of the body have much black pigment; and an interrupted line of distinct and larger pigment-specks passes from a point a little behind the eye nearly to the end of the 3rd dorsal, and at a short distance from the dorsal edge. A similar line is visible close to the base of the 2nd anal, and it may have extended further forward in life. Besides the bars the skin is covered by a general dusting of black specks, and these extend over the chin, opercular region, the median fins, especially the 1st anal and the anterior part of the 2nd. The dorsals show fewer specks. At the base of the pectoral dorsally is a patch of black pigment, and at a somewhat higher level in

front of it is a black spot on the operculum. The number of fin-rays in the 1st anal is 31, a larger number than has been met with in any example of the young of the poor-cod (*Gadus minutus*) over an area stretching from the North of Scotland to the Thames. The 1st branchial arch bears 20 filaments and 15 gill-rakers, the former a comparatively high number, and, moreover, they are ranged along the entire length of the gill-arch, whereas in the examples from the Thames they diminish rather abruptly before reaching the ventral edge. The 2nd, 3rd, and 4th arches respectively have 15, 13, and 11 gill-rakers. In the young poor-cod * of the same size from Aberdeen the numbers in each case were notably higher, though the long filaments at this stage had a similar shape.

Young poor-cod same length as young bib.

Gill-rakers.			
I.	II.	III.	IV.
27	19	16	16
19 or 20	—	17	—
24	18	14	12

The long filaments in the poor-cod of the same length are, like the example of the bib, long and slender.

In comparing the specimen from St. Andrews with examples of *Gadus luscus* of the same length from the estuary of the Thames, a noteworthy feature is the greater depth of the body and the high arch formed by its dorsal edge in the southern forms. The length of the 1st anal in the St. Andrews example is shorter than the pre-anal outline, that is, the distance from the anus the tip of the snout; whereas in the southern the pre-anal outline is shorter than the length of the base of the 1st anal fin. Again, the proportions of the 1st and 2nd anal fins in the respective examples differ, greater inequality being present in the southern forms. The two anal fins are more distinctly separated in the St. Andrews form, yet Schmidt † holds that in the bib they are practically connected and that the highest point of the 3rd dorsal and the 2nd anal lies far back, so that the anterior parts of these fins are almost parallel, a feature not evident in the St. Andrews example. The position of

* I am indebted for a series of these to the Fishery Board for Scotland.

† Meddelsers Fra Komm. for Havundesøgelser serie Fiskerei, Bd. ii. p. 57 &c.

the anus in the latter is somewhat behind that usually seen in the adult. Further, each specimen from the Thames has a dark pigment-band, which is visible after ten years' preservation in spirit, on the free edge of the caudal rays, which also showed less of a median indentation than in the St. Andrews specimen. The barbel in the latter is also thicker and slightly shorter, whilst the eye is proportionally larger. Some of these differences may be due to the precocity of the southern examples of the same length; for in the essential structural features the specimen of 77 mm. from St. Andrews pertains to *Gadus luscus* and diverges from the poor-cod (*Gadus minutus*). Whilst young forms of the latter are not uncommon in St. Andrews Bay, in consonance with the prevalence of the adults, the bib is less common, and few or none of 70 mm. have been previously obtained. It appears to be otherwise in regard to the poor-cod in Norwegian waters; for it is stated in the 'Scandinavian Fishes' that neither adults nor fry are ever seen close inshore, nor are they taken by the seine.

Allusion has often been made to a banded stage in the life-history of the bib. Thus Dr. Günther* mentions that the bib has cross-bands during life, and with a black axillary spot. Dr. Day † describes them as 5 or 6 broad vertical bands of rather darker colour descending from the back to the lower surface, meeting those of opposite sides. Mr. Couch ‡ and Malm § also allude to the same feature as an occasional occurrence. In the remarks on the bib and the poor-cod in 1888 || it was stated that the iridescence of the bib resembles that of the bronze-winged pigeon, the pale streaks on the sides occurring in broad blotches between the darker pigment-bands. Yet amongst many young bib captured along with young poor-cod, soles, and other forms in the nets of the shrimp-trawlers of the Thames, no banded forms were met with, and some were of the same length as the specimen here dealt with, whilst others were shorter or longer. Similar bands to those described in the examples from St. Andrews (70 mm. in length) occur in another 7½ in. long. The first is a band in front of the first dorsal fin and including its anterior third and thence to the pectoral. The second is a broad bar of dark pigment, separated from the former by a pale belt, which extended to the anterior third of the second dorsal. A broad pale band followed, and then a very well-

* Introd. to Study of Fishes, p. 541.

† Brit. Fishes, vol. i. p. 287.

‡ Brit. Fishes, vol. iii. p. 71.

§ In the 'Scandinavian Fishes,' i. p. 493.

|| Ann. & Mag. Nat. Hist., Oct. 1888, p. 348.

marked and broad belt from the posterior third of the second dorsal sloped downward and slightly backward to the ventral border. Traces of the dark band at the base of the tail are also visible, and the dark border to the tail is evident. In this example the filaments on the first gill-arch and the gill-rakers are exactly as in the young form as regards number, though the filaments presented a distal dilatation and terminated sooner ventrally than in the younger form of 70 mm.

2. *On the British Spionidæ.*

The Spionidæ were included by Dr. Johnston in the Catalogue of the British Museum under the Ariciidæ, a group which comprised representatives of various families. He recognized for the first time several, e. g. *Nerine vulgaris* (= *Scolecopsis vulgaris*), besides *Nerine coniocephala* (= *Nerine foliosa*, Sars), *Spio filicornis*, O. F. M., *Spio seticornis*, O. Fabr., and *Leucodore ciliatus*, Johnst. In the 'Invertebrate Marine Fauna of Plymouth' (1904) no *Spio* is recorded, but *Scolecopsis vulgaris*, Johnst., *Nerine foliosa*, Sars, and *Nerine cirratulus*, Delle Chiaje, *Aonides oxycephala*, Sars, *Polydora ciliata*, Johnst., *P. flava*, Claparède, *P. cæca*, Ersted, and *P. hoplura*, Claparède, are entered, besides *Scolecopsis giardii*, De Quatrefages, a synonym of *Scolecopsis vulgaris*.

In *Nerine foliosa*, Sars, the head forms a somewhat blunt cone, the dorsal ridge terminating posteriorly in a rounded enlargement followed by a short tentacle. The palpi are elongate and tapering. The body is from 6 to 8 inches in length and nearly $\frac{3}{8}$ in. broad, somewhat flattened dorsally and slightly convex ventrally, little tapered in front, but gradually diminishing posteriorly to the crenate anus, and in one a cirrus in the median ventral line and longer than the diameter of the vent occurs. The segments are about 200. In extrusion the proboscis forms a short cylinder, the free margin presenting an irregular series of frills, whilst ventrally the column is marked by longitudinal grooves. Occasionally in full protrusion two prominent lobes occur distally with a small bilobed process above and a single lobe below, whilst within the frilled margin laterally and inferiorly is a crenate brown line indicating a differentiation.

In the anterior region of the body (in spirit), where both fillets are present in the feet and where the branchiæ are large, each segment dorsally shows two transverse ridges

and a median furrow; whereas ventrally the segment is undivided, each being separated by a deep furrow at the junction in front and behind. In the next region, where branchiæ are less, the dorsum has an elevated transverse ridge with a narrow groove and a belt in front and behind. Ventrally a broad ridge with a furrow, and a narrower belt in front and behind, occurs. Still further backward, and where the branchia is represented by a rounded papilla, the dorsum shows an elevated transverse band with a more or less distinct median furrow, an enlargement in the centre of the dorsum anteriorly and one at each side, the intermediate region being marked by transverse lines. On the ventral surface a similar elevated transverse band is present, but the lateral enlargements are indistinct, and though there is an interrupted median band no median enlargement of the transverse band is visible.

The feet are furnished with branchiæ from the second backward, and they are amalgamated with the superior lamellæ from the 2nd to beyond the 50th. The inter-lamellar notch is distinct. The ventral lamella, at first prominent and rounded, becomes narrower and elongated from above downward on the appearance of the winged hooks. The latter occur in the superior division about the 70th bristled foot (Mesnil gives the 65th). The bristles in the upper division in front form two groups, a long upper series and a shorter inferior, all curved, dappled, and finely tapered. At the foot just mentioned (70th) the branchia has lost much of its external frill, and is again separated inferiorly from the posterior fillet of the upper division of the foot, which rises into a prominent border superiorly. The anterior fillet has disappeared in both divisions, and the fillet from the second ring of the segment runs up behind the posterior fillet at its ventral edge. The bristles in the upper division remain simple, but are more slender than in front. The inferior division carries winged hooks, with the exception of a few bristles superiorly and inferiorly. The chief changes toward the posterior end are the diminution of the branchia (which at the 125th foot forms a process less than the vertical diameter of the upper fillet), the diminution in the number of the superior bristles (which are in a single fascicle), the abbreviation of the upper border of the long fillet of the ventral division, and the increase and prominence of that part of the fillet bearing the bristles and hooks. Finally, the branchia diminishes to a minute rounded papilla, the upper fillet is short and almost semi-circular, whilst a broad gap separates it from the inferior

fillet, which, though diminished, resembles that in front, viz., has a more prominent margin at the lower half.

It is strictly an inhabitant of the sand.

Part of Dr. Johnston's description of *Nerine coniocephala* would apply to *Nerine cirratulus*, Delle Chiaje, whilst his figure indicates *Nerine foliosa*.

The second British species is *Nerine cirratulus*, Delle Chiaje, which has a wide distribution on both east and west coasts and extends to the Mediterranean. The head is acutely pointed anteriorly, the central processes passing backward to end in the median tentacle. The median ridge is supported by the buccal segment on each side, so that the snout appears to be trilobed. The eyes are four and small, the anterior pair wider apart; situated in front of the occipital tentacle. The body is 6-8 inches in length, and posteriorly terminates in a creuate anus. The branchiæ commence on the second foot, and the dorsal lamella is attached to the outer edge in front. At first, *e. g.* from the 10th to the 25th foot, the lamella has two divisions, then it becomes single and hatchet-shaped and is fixed only to the base of the branchia. At the 10th foot the long, almost filiform branchia projects upward, the coil of the included vessel leaving only $\frac{1}{6}$ of the length free. Nearly a third of the outer border is occupied by the upper flap of the division, and the free papilla at the tip projects upward in addition. The strong yet finely tapered bristles extend obliquely upward beyond the edge of the flap, and only traces of wings are present. The tips of the shorter bristles form a regular series nearer the edge of the flap, and the broader and less tapered extremities of these show indications of wings. All are minutely dotted, as mentioned by De St. Joseph. The flap of the inferior division forms an irregular semicircle, shorter from above downward than the superior, but projecting further outward. The dotted bristles also form two series, viz. a lower group with finely tapered tips and a shorter series with slightly winged tips; the upward slope of these bristles being less than in the case of the dorsal. Little change occurs at the 25th foot except the increase of the inferior lamella, the subulate condition of the branchia, and the more slender bristles. The hooks have a bold upward curve toward the end of the shaft, then the diminished tip bends backward and ends in a small, blunt fang with a spike on the crown, the whole guarded by wings. At the 70th foot bristles still occupy the upper division, so that the southern forms, from which Mesnil drew up his description,

differ considerably from the northern. The diminution of the branchia goes on posteriorly with the separation of the lamella behind the bristles. Mesnil includes under this form *Malacoceros longirostris* of De Quatrefuges, *Nerine agilis*, Verrill, and *Nerine heteropoda*, Webster.

The third species is *Scolecopsis vulgaris*, Johnston, which has a truncate head with a frontal tentacle at each side, the anterior border forming the base of a triangle, the apex of which goes to an adherent occipital tentacle. The long palpi are pale, marked externally by whitish bars with the zigzag blood-vessels. The eyes as a rule are absent in the preparations. The body is 3-4 inches long, slightly narrowed in front, and tapering posteriorly to the vent, which has 8 cirri (De St. Joseph gives 20-30 and Mesnil 16). The first foot carries a distinct though small branchia. The bristles of the upper division form a fan and are in two sections, the dorsal much longer, more slender and more finely tapered, and an inferior group of shorter bristles also with finely tapered tips. The bristles of the fan-like ventral row are similar in structure, but shorter. All lie in front of the lamellæ. At the 10th foot the inferior lamella is vertically elongated, its upper edge embracing the branchia, whilst its inferior forms a rounded lobe ventrally. The upper group of golden bristles still point dorsally, but they are shorter. The long lower bristle-row is curved backward. The lamella of the inferior division is short and hatchet-shaped. Beneath the foregoing is a small lamella, probably homologous with the papilla present in *Nerine*. No noteworthy change occurs in the 25th foot, except the increase of the ventral lamella, and the same may be said as far as the 50th. About the 50th, however, the elongation of the ventral lamella is conspicuous, and a series of long, winged hooks appear in this division. These have stout curved shafts, a strong and sharp main fang, and two well-marked spikes on the crown. Short bristles accompany the hooks, and about three are prominent ventrally. De St. Joseph found that the hooks appeared between the 30th and 52nd, whilst Mesnil gives from the 35th to the 37th. Except that a diminution in the general size of the feet occurs, the arrangement is similar at the 100th foot, but the dorsal bristles are considerably longer and more slender. The branchia remains fairly large, and the ventral hooks retain the same type as in front and are accompanied by the short bristles. In life the lamellæ of the feet as well as the branchiæ, which meet those of the opposite side in front,

are muscular, and perform various movements. Mesnil could not satisfy himself as to the identity of Johnston's *Nerine vulgaris* with De Quatrefage's *Malacoceros vulgaris* vel *Scolecopsis girardi*. He points out that what was sent to him from Heligoland as *Nerine vulgaris*, Johnston, pertains to *Scolecopsis fuliginosa*, Claparède. Ehrenbaum, he states, considered the *Aonis wagneri* of Leuckart as identical with the supposed *Nerine vulgaris*, and Mesnil thought *Colobranchus ciliatus*, Keferstein, a distinct form, a view not now held.

The fourth British species is *Scolecopsis fuliginosus*, Claparède, in which the head in lateral view is more pointed than in *Scolecopsis vulgaris*, and in front has a median cleft. The constriction behind the broad base of the frontal tentacles is more marked. A cream-coloured patch occurs on the prostomium, with black pigment on that region and on the dorsum as well as on each side of the mouth. The palpi have dark bands. The body is about 3 inches long, smaller, as a rule, than *Scolecopsis vulgaris*, with longer branchiæ anteriorly, and it tapers a little in front, but much more posteriorly, where it ends in a vent with 8 flattened cirri. The segments numerous—150 to 160.

The first foot carries a larger branchia than in *S. vulgaris*, and the superior lamella is narrower and the tip more acute, whilst the inferior lamella is also narrower and more prominent. The bristles are similar, but more delicate. At the 10th foot the branchia is a long, richly ciliated process, the upper lamella is hatchet-shaped, pointed and free superiorly, the inferior lamella being capstan-shaped. The long bristles at the upper edge of the dorsal tuft have narrow wings, and the shorter forms, dorsally and ventrally, are finely tapered. The branchia and superior lamella diminish before the 50th foot, about which foot three or four winged hooks appear in the ventral division. These hooks differ from those of *Scolecopsis vulgaris* in the larger angle made by the main fang with the neck, in its rather blunt tip, and in the presence of only a single spine on the crown. The ventral hooks and associated short bristles continue to the posterior end. This form is not uncommon in the south. Mesnil makes two varieties, viz. var. *microchæta* from Naples, and *macrochæta* from the Channel, and further two subdivisions, viz. *minor* and *major*, but such distinctions are mainly of interest in demonstrating the variability of the species.

The fifth member of the group is *Scolecopsis (Laonice)*

cirrata, Sars, a northern form which extends from Shetland to the S.W. of Ireland, and abroad to Greenland, Norway, and Canada. The broad anterior edge of the short head is smoothly rounded, or in some slightly bilobed. A somewhat triangular ridge, with the base in front, passes backward and ends in a point posteriorly, from the apex of which a small subulate tentacle springs. Two eyes are present, one on each side of the ridge in front of the tentacle. A lamella occurs at the base of the long tapering palpi. The body is about 1-2 inches in length, and is little tapered in front, so that it has a truncated aspect. It is rounded dorsally and deeply grooved ventrally from end to end. The first foot bears a branchia and a large hatchet-shaped lamella, with a conical end superiorly and a somewhat straight margin inferiorly. The ventral lamella is nearly as large, bluntly conical superiorly, and curving to a sharp angle inferiorly. The dorsal bristles are capillary, the long tuft being superior, the shorter inferior. The branchiæ continue of considerable size to the 25th foot, the great dorsal lamella remaining nearly as at the 10th foot and is almost reniform. The ventral lamella is slipper-shaped, the broad end being uppermost, and both are free. The winged hooks appear about this (25th) foot, have a slight dilatation of the shaft above the backward curve, then gradually diminish to the throat, from which the main fang comes off at a little more than a right angle, and a single spike occurs on the crown. Two slender capillary bristles are below the hooks. The bristles become very long and attenuate posteriorly, and wings are not evident. Not a single British example is complete, and few go beyond the 25th foot.

The British species of the genus *Spio* have hitherto been involved in considerable obscurity, for though three are described by Dr. Johnston in the Catalogue of the British Museum, it is by no means easy to identify them. Only two are entered by Malmgren as occurring in northern waters, viz. *Spio filicornis*, O. Fabr., and *Spio seticornis*, O. Fabr., both of which were known to O. Fabricius, who founded the genus for annelids with two long tentacles. Dr. Johnston in 1838 placed *Nerine* and *Leucodore* under the same head. Örsted separated the genera *Nerine* and *Spio* by the form of the dorsal lamellæ; whilst Claparède showed that this distinction was artificial. Mesnil, again, thinks that Malmgren complicated the question by reviving the generic name *Scolecopsis* and undid the advance made by Claparède, a view which cannot now be held. Yet he affirms that Malmgren

conserved the genus *Spio* without definitely defining it, and described under the name *Spio filicornis*, O. Fabr., a species which he (Mesnil) has demonstrated to be very near his *Spio martinensis*, and he doubts if Malmgren's form is that of Fabricius, though the figure pertains to the same genus. He does not accept Levinsen's inclusion of the genus *Nerine* of Johnston under *Spio*. He does not, in short, know any species falling within the description of the two species of Fabricius as entered by O. F. Müller.

For the present purposes the genus *Spio* may be characterised, after Me-nil, as having a prostomium without frontal tentacles; branchiæ from the first setigerous segment to the end; anus surrounded by cirri; always two rows of bristles in each division; and after a certain segment (8th to 15th) the posterior row is formed by winged hooks. The first species is *Spio filicornis*, O. Fabr., which has a snout somewhat like that of *Polydora* on a large scale, or akin to that of *Pygospio*, with a blunt bifid median rostrum and a bulging process of the buccal segment on each side. Two or three minute eyes occur on each side of the median ridge posteriorly. The median process passes from the tip of the snout backward to end in a conical papilla. The body is 2-3 inches in length, broad and scarcely tapered in front, but gradually diminishing to the moderately slender posterior end, which has two thicker cirri dorsally and two more slender cirri ventrally. The segments range from 60 to 80. The ligulate branchiæ occur on all the bristled segments. The superior lamella of the 10th foot is bluntly rounded dorsally and slopes obliquely to the wide notch inferiorly. The ventral lamella is more or less semicircular. The bristles of the upper division form a wide tuft; the longest superiorly, and all are curved backward and winged. The ventral bristles are somewhat shorter, but similarly tapered, and some of the lower forms present a slight dilatation in the winged region. The type of bristle rapidly changes, for at the 14th foot, or sooner, a row of hooks appears in the ventral series, with finely tapered short bristles in front, and a few winged bristles inferiorly. The upper lamella gradually diminishes, and still more the inferior, so that the setigerous process becomes prominent, and a group of bristles at the ventral edge of the inferior division becomes modified—each being curved, flattened, and furnished with a hook or a probe-tip. The winged hooks have straight shafts, which increase in bulk superiorly, then curve backward and slightly dilate before the contraction at the throat. The strong and

sharp main fang comes off nearly at a right angle and the crown has a single sharp spike. This form was dredged in 8 fathoms in Bressay Sound. Mesnil's *Spio martinensis**, which he hints may yet be linked on to *Spio filicornis*, O. Fabr., differs in the form of the head, since it has no fissure in front, but the author's drawings perhaps need more definition. Moreover, he mentions no occipital tentacle. The number of segments, the size, and the general structure of the tail, feet (from the 1st backward), and bristles agree, yet in the British form the latter are not punctated, a feature of moment, for only longitudinal striæ are visible even in the inferior ventral.

Spio seticornis, Fabr., has a head produced anteriorly into a rostrum, with two small frontal tentacles, the central region supported by the buccal segment on each side. It is about an inch in length, little tapered anteriorly, and gradually diminished posteriorly. The branchiæ commence on the first segment and apparently continue to the posterior end. They seem to be conspicuous about the middle of the body. The foot has a narrow and prominent superior lamella in front and a small conical lower lamella. The former diminishes posteriorly and the latter becomes flattened out as a narrow rim. The bristles present a long dorsal group and a shorter lower group in the superior division, and a similar short group in the ventral division anteriorly; but at the 8th bristled segment the place of the latter is taken by winged hooks, the main fang of which comes off at a large angle from the neck and is not very acutely pointed, the rounded crown bearing a single spike.

This differs from the previous form in so far as the hooks appear before the 10th bristled segment, probably at the 8th. Thus at the 5th foot the branchia is well developed, whilst the upper lamella passes outward and upward as a broad conical flap, and the bristles form a diminishing series from above downward. The inferior lamella is small, forming a short blunt cone pointing below the setigerous process. At the 10th foot the branchia is larger and apparently flattened, the upper free edge above the superior lamella is shorter. The superior lamella is small at the 25th foot, but the branchia remains large; it becomes less at the 50th foot. It is difficult to say what the *Spio seticornis*, Fabr., of Cunningham and Ramage † is. Mesnil thinks it has

* Bullet. Sc. Fr. Belg. xxix. p. 122, pl. vii. figs. 1-20 (1896).

† Trans. Roy. Soc. Edin. vol. xxxiii. p. 640, pl. xxxvii. figs. 4, 4 A, & 4 B.

the characters of *Pygospio elegans*, but this is doubtful. Two thick anal cirri occur posteriorly.

A softened fragment from the deeper water off St. Andrews Bay appears to pertain to a distinct form which may provisionally be termed *Spio* D. It is about 2 inches in length and with subulate branchiæ from end to end. Two eyes occur anteriorly. The dorsal division of the foot has long tufts of finely tapered capillary bristles, and the ventral appear to have a similar character, though this was not observed *in situ*. Posteriorly the dorsal bristles increase much in length. Some of the tufts show also a shorter series of stronger bristles with a distinct hook at the point, and in some groups in the pulpy preparations no other form occurs. It may be that the shorter hooked forms represent the ventral series posteriorly.

A small form procured between tide-marks, St. Peter Port, Guernsey, may be related to *Spio mecznikowianus** of Claparède or to the *Spio atlanticus* of Langerhans †, since, so far as can be made out, the dorsal lamella does not fuse with the branchia, which seems to extend from the second segment almost to the posterior end. Claparède, however, gives his form only two anal cirri, whereas Langerhaus states that there are four, the number present in the form under consideration, and they are similar to those of *Pygospio elegans*. The head somewhat resembles that of the species just mentioned, having two rounded bosses in front, apparently better defined than in *Pygospio*. The median ridge continues backward to the first segment or a little further. On each side, about the middle of the head, is a conspicuous black eye, and a trace of a second pair a little behind. The tentacles are absent. The body is comparatively small, about half an inch in length, somewhat broad and flattened in front and then slightly tapering to the snout, more gently tapered and rounded posteriorly, the tail terminating in a minute segment with 4 somewhat short conical cirri as in *Pygospio*. In the anterior segments the dorsal lamella, as viewed from above, appears to be filiform—sloping obliquely backward behind the bristles. Winged hooks occur ventrally on the 8th foot and continue to the posterior end. The shaft of the hook dilates from the narrow proximal end nearly to the wings, curves backward below these, continues

* *Annél. Nap.* p. 324, pl. xxiii. fig. 2.

† *Zeitschr. f. w. Zool. Bd.* xxxiv. p. 89 (1850).

of nearly the same diameter almost to the neck, which is narrowed, but not much. The main fang comes off nearly at a right angle and is short and sharp, a single spike only occurring on the crown, and thus agreeing with the form described by Langerhans. The bristles follow the typical arrangement.

A *Spio* (G) from the deeper water off St. Andrews Bay is characterized by the rounded or bluntly pointed snout, the mouth opening a short distance behind the tip. The two tentacles are of moderate length and adhere firmly to the snout. At least one eye occurs on each side at the inner base of the tentacle. The body is about half an inch in length, somewhat rapidly tapered anteriorly, and more gently posteriorly, where it ends with cirri (only one of which is present). The dorsal surface is somewhat flattened, the ventral rounded. No branchiæ are visible. The dorsal lamellæ are much developed and foliaceous in front, especially the third. Winged hooks make their appearance about the 15th bristled segment; they are slender, slightly tapered after the backward curve to the throat, have a main fang and a single spike on the crown. The dorsal lamellæ diminish greatly after the 15th segment, and in the posterior half form small conical processes behind the setigerous papilla. The ventral division in the same region is represented by the hook-papilla. The dorsal bristles are capillary, finely tapered, and curved backward. Posteriorly they greatly increase in length and are very slender.

A species swarming in sand near low-water mark, St. Andrews, and also dredged in 2 fathoms off Symbister Harbour, Shetland, has been provisionally named *Spio gattyi**. The head terminates anteriorly in a rounded point—the centre of a cone formed by the buccal segment. A minute black eye occurs on each side of the median ridge, which ends in an occipital papilla or tentacle posteriorly. The body is about an inch in length, proportionally short and stout, a little tapered anteriorly, and more so posteriorly, where it ends in two broadly ovate cirri. The branchiæ are conspicuous from the 1st foot to the end. The dorsal lamella of the 1st foot is elongate-ovoid, with about a third of the dorsal edge free, the rest fused to the base of the branchia, the lower margin trending gently to the body-wall. The dorsal bristles are of moderate length, curved upward and slightly

* Named after the founder of the St. Andrews Marine Laboratory.

backward, finely tapered, the upper series long and slender. The ventral lamella is a prominent, obtusely ovate process. By-and-by the superior lamella is flattened externally and less free superiorly, and the ventral lamella assumes a rhomboidal outline—rounded at the inferior angle. The winged hooks commence in the ventral division about the 13th foot along with the delicate bristles, and they show a main fang with a spike on the crown. The lamellæ increase in size immediately before the 50th foot, the winged hooks to the number of 9 occupying nearly the entire length of the ventral lamellæ.

A small form not hitherto recorded, though it has long been known in Britain, is *Pygospio elegans*, Claparède*, which occurs abundantly in sandy tubes in fissures of rocks and similar localities in various parts of the kingdom. The head is bluntly bifid, with a median ridge running backward to the second segment. The eyes are 2, 4, or 6, situated on the ridge or behind the middle of the ridge and between the tentacles, which are very long and attenuate. The body is very slender and elongate—of a dull yellowish colour with a tint of orange, the anterior third being reddish from the blood-vessels. The segments number from 40–60. The first twelve bristled segments are narrower than the succeeding. The branchia appears on the 13th segment, and to its outer border the somewhat crenate lamella is fused. From 19 to 25 pairs of branchiæ are largely developed, with conspicuous cilia in a row along the median anterior region, the rows of opposite sides being connected by an intermediate line of these organs. The largest branchiæ are about the posterior third of the series, and they appear to differ from the French examples, which have the branchiæ, according to Mesnil, equally developed throughout, and that, moreover, their number is usually 8, though they may reach 23. Posteriorly the body terminates in 4 small whitish conical processes which are not ciliated. Anteriorly the feet have conical dorsal lamellæ and smaller conical ventral lamellæ, but the latter soon diminish. The upper dorsal bristles are long and finely tapered, whilst the lower and shorter have broader tips with finely tapered ends. The wider ventral forms occur on the 3rd foot, as indicated by Mesnil. All the bristles are dotted and curve backward. This type of foot extends only to the 7th, for the 8th has its ventral bristles replaced by winged hooks, about 4 of which occur on each

* Beobach. p. 37, pl. xiv. figs. 23–31 (1863).

foot. The wings are short and broad, expanded and smoothly rounded at the free end. The shaft has a forward curve distally, then it bends backward below the wings, and slightly diminishes at the throat, from which a short sharp main fang passes off at little more than a right angle, and with a single prominent spike on the crown. Posteriorly the dorsal bristles greatly increase in length and slenderness, stretching upward and outward as a hair-like tuft, whilst the superior lamella is represented by a small conical papilla above their base. The hooks occupy the same relative position, but the number is greater, viz. about 7, and a slight rim indicates the ventral lamella.

Another form very common amongst sand near low-water mark at St. Andrews is *Spiophanes bombyx*, Claparède*. In this the head has two short frontal tentacles, from which a median elevation passes backward to end in a small conical peak or eminence. The two palpi are of moderate size, contain blood-vessels, and are frequently coiled. A small eye-speck occurs posteriorly on each side of the median ridge near the peak, and in the preparations are raised, with the ridge, above the general level. An anterior pair, a little wider apart, lies in front of them. The body is about 3 inches in length, very little tapered anteriorly, and much more so posteriorly, where it ends in a wide vent with crenate lips and two short ventral cirri. Many specimens have reproduced tails, for the species is remarkable for its fragility. The dorsum is somewhat flattened anteriorly, rounded throughout the rest of its extent, and marked ventrally by a median band, which, when it comes to the vent, splits, a limb curving upward on each side to join the dorsal band, and it may be indicating the junction of the ventral with the dorsal vessel. A median and two lateral brownish lines occur on the dorsum behind the head, but they pass only a short distance backward. The sides are vascular anteriorly, then of a pale brownish hue, thereafter orange from the colour of the gut. The ventral surface is pale, though the gut is visible.

The 1st foot has dorsally a subulate or narrow lanceolate lamella (cirrus) which has been shifted inward, so that it resembles a branchia. The dorsal bristles are very long and slender, with hair-like tips and with no evident wings. They spring from a conical setigerous process, also carried inward on the dorsum. The ventral bristles of this foot are shorter

* Mém. Soc. Phys. et Hist. Nat. Genève, xx. p. 485, pl. xii. fig. 2.

but similarly filiform at the tip. In addition two much thicker bristles, winged at the tip, resemble modified hooks, since they end in a small claw-like tip. These hook-like bristles apparently perform a special function in the tubicolous habits of the species, just as the homologous organs of *Sclerocheilus* do. Either considerable variation occurs or Mesnil's figure of these organs is at fault, for he shows and describes them as having a simple tapering tip and winged in the ordinary way, whereas the specimens from St. Andrews have the tips specially differentiated and the wing adjusted like that of a hook.

The dorsal lamella moves gradually to the dorso-lateral region, and the foot at the 6th bristled segment presents a massive lateral enlargement. This is more clearly shown at the 10th foot, the dorsal lamella being now considerably shorter, though still subulate, and the base is broad. The dorsal bristles can be differentiated into a longer upper series and a shorter and stouter lower series, as usual in the group, and they spread in a fan-like manner in front of the dorsal lamella. The ventral lamella has been modified into a great lateral mass which passes upward to the base of the dorsal lamella. The ventral bristles are short and stout, the lower forms distinctly curved backward at the tip, which is minutely dotted or mottled as well as winged, and appears, indeed, to be the special bristle figured by Mesnil—so different from the two peculiar hook-like bristles of the ventral division of the first segment. The laterally enlarged feet seem to be most prominent from the 4th to the 14th. In its progress backward the dorsal lamella or cirrus becomes less and presents a ventral enlargement, which is very marked, for instance, at the 15th segment, the massive base being in contrast with the slender distal process. Moreover, the winged hooks appear in the ventral division of this foot as a row of four, and beneath them is a single strong curved bristle or two with the dotted or mottled tip, which points downward. The feet considerably diminish from the 20th to the 30th. Thus at the 25th the shape of the dorsal cirrus or lamella is like that of a leg of mutton, the shank formed by the tapering cirrus itself. The dorsal bristles are still arranged in a fan-like tuft, the upper being the larger, and a line of powerful cilia runs from the foot inward on the dorsum. The space between the divisions is much reduced, and below the hooks are two of the powerful, slightly curved bristles which have the dotted distal regions and sharp points. The winged hooks are proportionally small, have a slightly curved and sharp main fang, coming off nearly at a right

angle from the throat, and with a small spike on the crown. At the 30th foot at least a dozen of these organs project from the surface.

Just in front of the tail the dorsal cirrus is moderately long and subulate, and occasionally it shows a basal enlargement. The dorsal bristles project for a third of their length beyond the tip of the cirrus. The region between the divisions of the foot is convex, and below the row of 7 or 8 hooks 1 or 2 curved bristles project. The convexity of the curve is outward.

Formerly, in consonance with the Catalogue of the British Museum, it was supposed that only one species of *Polydora* occurred in British waters, but more extended examination shows that at least five species are found in our seas besides *Polydora caeca*, Ørsted, entered in the fauna of Plymouth, but which has not yet been examined at St. Andrews. The genus (founded by Bosc) was first clearly described by Claparède, who, however, included it under the Ariciidæ. The first species, *Polydora ciliata*, Johnston, has the prostomium elevated and terminating anteriorly in two rounded lobes with a median notch, the ridge passing backward to the 3rd segment. Four black eyes are on the ridge, and dark pigment occurs at its sides and in the furrows of the first four segments. The body is largest in the anterior third, flattened dorsally and rounded ventrally, tapered a little anteriorly and more distinctly posteriorly, where it ends in a cup-like process with a dorsal notch. The segments are from 60-75 in number. The branchiæ commence on the 7th foot and their number ranges from 22 to 31. Thus they differ from Mesnil's form of *P. ciliata*. The first foot has a dorsal lamella but no bristles, but the latter occur throughout the rest of the body. The fifth bristled segment has large hook-like bristles, the tips are curved, more or less acute, and have a small spur on the neck. This form is very widely distributed in European waters.

The second is *Polydora flava*, Claparède, which extends from Shetland to the Channel Islands and is common in the Mediterranean. The bifid prostomium is usually longer than in *Polydora ciliata* and the divergent processes more distinct. A little pigment occurs on each side of the prostomium in front. Eyes are not visible in the preparations. The median ridge of the snout reaches the fourth bristled segment. The body is of considerable proportional size (2 inches or more in length) in contrast with *P. ciliata*, but of similar con-

formation. The terminal caudal process has an even (continuous) rim. The first foot is peculiar in having bristles in its dorsal division, which presents a rounded lamella with a setigerous process in front and a small tuft of tapering bristles slightly curved backward *in situ*. The ventral division has a similar though somewhat broader lamella, in front of which is a conspicuous group of longer upper and shorter lower bristles, the latter having distinct traces of wings. The second, third, and fourth feet have completely formed dorsal and ventral divisions. The 5th segment has minute tufts of dorsal and ventral bristles, as in other forms, besides the great hook-like bristles which have the concavity of the tips directed backward, and which are arranged in a curve. In the ordinary condition the shaft enlarges from the base upward to the middle, then slightly diminishes to the tip, which forms a lever-like hook with a concavity posteriorly and an excavation in front. The foregoing hook-like bristles are accompanied by a series of spear-shaped bristles. In the developing hook the distal curve is very marked, and a small shoulder appears at the base of the concavity in front, whilst a lateral dimple and elevation and a differentiation at the commencement of the terminal curve are evident. In frontal view, as Mesnil shows, the distal region is likewise differentiated. The winged hooks commence in the ventral division of the 7th bristled segment. Each dilates a very little above the base and has a marked forward curve throughout the greater part of its length, then bends backward and diminishes to the neck. The main fang comes off at a considerable angle to the neck and is sharp, but the spike on the crown has a small angle with the fang. The dorsal bristles become extremely slender posteriorly, though of considerable length. Moreover, bundles of bristles even more slender than the foregoing occur in each foot posteriorly and they somewhat resemble linear crystals, being perfectly straight and slightly tapered at each end. The function of these is unknown. Mesnil states they are extremely caducous, and do not occur in front of the 80th bristled segment. The bacillary pouches seem to contain only granules somewhat larger than in *Magelona*. The branchiæ commence on the 8th segment, attain their maximum a few segments behind, and then they gradually diminish, the total number being about 35-40.

A third species appears to approach the *Polydora quadrilobata* of Jacobi*. The head has smaller prostomial lobes

* Anat. histolog. Untersuch. der Polydoren der Kieler Bucht. Wissenfels, 1883, p. 6, Taf. i. & ii.

than *Polydora flava* and the median ridge goes backward to the 4th segment. The snout differs from most of the other forms in its conical outline, since the peristomial supports taper anteriorly. Jacobi describes and figures four eyes on the median ridge between the tentacles, though they are frequently absent. The arrangement of the bristles in the first four segments appears to be typical, though they are somewhat shorter than in *Polydora ciliata* or in *P. flava*, and the groups in the dorsal division are clearly differentiated. The fifth foot is distinguished by the large size and conspicuous condition of the dorsal capillary bristles (Pl. V. fig. 3), for the expanded distal region is bent at an angle to the shaft, and the tapered tip is again curved; thus the aspect is that of a pointed bill-hook. The great hook-like bristles (Pl. V. fig. 2) dilate from the base upward fully two-thirds of their length, then slightly diminish to the throat, from which a short distal region comes off at considerably more than a right angle and ends in a bifid truncated tip. Six or seven occur on each side, but the tips of only four or five project from the surface. Jacobi * describes and figures those of his *Polydora quadrilobata* as ending bluntly with a right and left spur and a thin guard or wing. The latter, however, was not visible in this example, but may have been abraded. The ventral tuft is considerably smaller than the dorsal, but the type of bristle is maintained on a diminished scale.

So far as could be ascertained in the fragmentary form, the branchiæ commence on the 7th bristled segment, and the hooks, which do not materially differ from those of *Polydora ciliata*, on the 7th segment. Jacobi represents the anal funnel as 4-lobed, but it was not present in the British specimens.

Langerhans † describes *Polydora armata*, from Madeira, as having in the 5th segment two or three large hook-like bristles with trifid tips, but his figure shows a blunt, curved tip deeply cleft and winged, the outline being very different from Jacobi's. The prostomium is bifid, and the peristomial lobes are also blunt in front. The branchiæ occur from the 7th to the 12th segment. Moreover, in the last five or six segments brownish, stiff, straight, tapering bristles are present, thus differing, he observes, from Keferstein's *P. ciliata*, with which the branchiæ agree. The anal funnel has a dorsal and a ventral hiatus. If figures can be relied on, the tips of the large bristle-like hooks of the 5th segment as well as the anal funnel differ from Jacobi's species, and

* *Op. cit.* p. 8.

† Zeitsch. f. w. Zool. Bd. xxxiv. p. 93, Taf. iv. fig. 5.

Carazzi* compares the former with the pedicellaria of Echinoderms.

The fourth species, viz. *Polydora carazzi*, seems to be new, the prostomium anteriorly forming a smoothly rounded process, and thus characteristically differing from any of the foregoing. This process projects very little in front of the rounded lobes of the peristomium at the sides. The median ridge is slightly contracted behind the process, and passing backward terminates at the fourth bristled segment. The mouth opens on the ventral surface as a long triangle with a prominent lip on each side. No eyes are visible in the spirit-preparations and no pigment, but it may be different in the living examples. The body, of which only the anterior 26 segments remain, tapers from the 4th segment forward, the rest having nearly the same diameter; and it is a feature that the 5th bristled segment is fully in a line with the others, its antero-posterior diameter, as usual, being greater than that of the segments adjoining. The first foot has both a dorsal and a ventral lamella, but only a tuft of ventral bristles, the tips being directed rather outward than backward, the convexity of the curve, however, being forward. They are shorter than those immediately following. The 2nd, 3rd, and 4th feet offer no feature of note. The fifth foot is unusually prominent, and bears dorsally a strong tuft of capillary bristles, the flattened, winged, and rather short tips of which curve somewhat abruptly backward. The great hook-like bristles have the points of the main fang directed backward and slightly upward, and each consists of a broad flattened shaft (Pl. V. figs. 4 & 5), which dilates from the base to the distal third, where a gentle curve backward and a little diminution towards the throat occur; but whilst the inner outline is even, the outer shows a slight projection rather below the throat, which is by no means narrow. The strong main fang comes off at a little more than a right angle, and the tip is not very acute. Moreover, the crown of the fang seems to have the upper edge flattened and prominent on each side, whilst distally a comb-like crest with a serrated edge curves from the back of the crown almost to the point of the fang, so that *uncinus crista-galli* might be an appropriate name for such a hook. Indications of striæ which slope from behind forward and upward show that this crest is an aggregate of spines. Only a few bristles occur in the ventral tuft of this segment. The 6th bristled

* Mitt. Zool. Stat. zu Neapel, ii. Bd. p. 21.

segment has lamellæ and dorsal and ventral bristles like the 4th, and winged hooks commence on the ventral division of the 7th, where also the branchiæ originate. The winged hooks (Pl. V. fig. 6) do not offer any diagnostic feature except their small size, a single spur occurring on the crown above the great fang. In contrast with *Polydora flava*, the lamellæ of the feet generally and the bristles are shorter, whilst the hooks project similarly in both. The species seems, so far as known, to be sparingly distributed.

The *Polydora hamata* of Langerhans* also possesses a smoothly rounded prostomium, and the sides of the peristomium form a blunt cone. The great hook-like bristles of the 5th segment, however, somewhat resemble those of *Polydora flava*, and thus differ from the foregoing. The ventral hooks, moreover, have a brown belt on the neck, and the last 30 segments, or thereabout, have hook-like bristles, after the manner of *Polydora hoplura*, whilst the anal funnel is 4-lobed—all points of divergence from the preceding form.

The fifth and last of the series is *Polydora hoplura*, Claparède, which extends from the Outer Hebrides to Plymouth, and is also found on the east coast at St. Andrews. The head is similar to that of *Polydora ciliata*, except in the absence of black pigment in the preparations. The prostomium anteriorly has a median notch and two rounded lateral regions. The arrangement and shape of the lamellæ and bristles of the first four bristled segments are like those of *P. ciliata*. The fifth segment has hook-like bristles which are distinguished at first sight from those of *P. ciliata* by the parallel arrangement of the tips *in situ*—a feature due to their more uniform diameter,—by their peculiarly curved and by no means sharp tips, and by the position and size of the lateral spur at the neck. The branchiæ and winged hooks commence on the 7th segment, the hooks having a somewhat long main fang coming off nearly at a right angle with a single spur above. The feature most diagnostic of this species, viz. the hook-like bristles of the last 15 segments, is absent in the majority of the imperfect examples, but where the caudal region is present the region occupied by the hooks seems to be distinguished by the diminution of the prominent tufts of bristles characteristic of the region in front. The strongly curved and sharp hook-like bristles

are probably connected with the special functions of the region, which may require a hook of a different type from the ordinary winged form.

Some place the next form, viz. *Magelona papillicornis*, Fritz Müller, under a special family, but for the present it may be included, as formerly, under the Spionidæ. The head (prostomium) is a large, flattened, and somewhat ovoid muscular process, with chitinous basement-tissue, marked marginally by anastomosing vessels and forming a roof to the peristomial segment beneath it. The mouth opens ventrally, and the proboscis is extruded as a pinkish mushroom-shaped organ. The tentacles are remarkably long (2-3 inches), with large adhesive papillæ on the distal two-thirds, and non-caducous. Touches of dark pigment occur as bars on them. The body is from 4-6 inches in length, apparently of two well-marked regions—the anterior short, consisting of 8 segments, and the posterior of more than 100; but the peculiar 9th segment perhaps indicates a third region. The body is somewhat quadrangular in section throughout. The first region (of 8 segments) is narrowed behind and marked by a dorsal and a ventral longitudinal band, whilst the 9th segment is remarkably narrow. The third region is anteriorly of greater diameter than the first, continues of considerable breadth for some distance, and then gradually tapers to the tail, which ends in a rounded border having the anus within it, and with a short cirrus on each side. The lateral regions of the greater part of the third division of the body are modified into processes with peculiar convoluted organs composed of the cuticle, hypoderm, and basement-tissue.

The dorsal lamellæ of the first division are scoop-shaped, and the ventral are similar though smaller. The bristles of the region are capillary. The bristles of the 9th segment are shaped like a mace with a process at the tip, and differ from all the others as do the lamellæ. The third or posterior region has on each foot a row of winged hooks dorsally and another ventrally at the edge of the quadrangular body, whilst the somewhat ovate lamellæ are between them. The species ranges from Brazil to Britain.

The interesting *Pœcilocheatus serpens* of Dr. Allen*, from Plymouth, probably comes near *Disoma* and *Scalibregma*. The pelagic post-larval types occur frequently at St. Andrews, yet no adult has ever been found there.

* Quart. Journ. Micr. Sc. vol. xlviii. p. 79, with plates vii.-xii.

3. On the Spionidæ dredged by H.M.S. 'Porcupine' in 1869 and 1870.

Besides the widely distributed *Scolecoplepis cirrata* of Sars, east of Cape de Gatte, in 16 to 60 fathoms, a form apparently falling under the genus *Nerinides* of Mesnil, and which may be termed *N. lamellata*, was dredged in the expedition of 1870 in Tangiers Bay at a depth of 35 fathoms. Only the anterior region is present. The head (Pl. V. fig. 7) forms an even transverse margin in front, with a short blunt tentacle at each angle, and from the centre a short elevated region proceeds backward, to end in a small process which is pointed posteriorly like an adherent tentacle. Minute eyes seem to be present on each side of the latter, but the condition of the specimen renders accurate determination difficult. The whole region is thus unusually short, and the proboscis is thrust out as a short cylinder with a crenate margin. The body is flattened, slightly and abruptly tapered anteriorly, and with a median band ventrally. The segments are narrow and numerous. The 1st foot carries a subulate branchia and a large lanceolate lamella projecting freely upward nearly as far as the branchia. The dorsal bristles are very slender, long, and finely tapered, and they have the normal position characteristic of the family. The ventral division also has a lanceolate process, and the bristles are long and slender. From the form of the body the bristles and lamellæ occupy the dorso-lateral edge, so that the branchiæ, which readily fall off, pass transverse'y inward over the flattened dorsum. At the 10th foot the branchia is well developed, though still subulate, and the dorsal lamella forms a large lanceolate flap directed upward and inward. The bristles (Pl. VI. figs. 1 & 2), both dorsal and ventral, are long and slender in mass, and have a dull golden colour. The ventral lamella is now a broad, almost semicircular flap, with a tendency to a peak inferiorly. The bristles (Pl. VI. fig. 3) are in two groups, viz. finely tapered forms which stretch outward along the lamella, and a ventral series of shorter, broader bristles overlapping the former, like those seen in a *Scolecoplepis* from Bressay Sound; but their tips are acute, not probe-pointed.

The branchia remains subulate at the 25th foot (Pl. VI. fig. 4) and stretches beyond the elongated upper lamella, which is acutely lanceolate superiorly, its outer edge being comparatively even till it curves inward inferiorly. The ventral lamella forms a blunt flap with the bristles in the groups formerly indicated. The branchia is still rather long

and subulate at the 50th foot, and the upper lamella is prominent and rounded inferiorly, whilst superiorly it is acutely lanceolate. The upper bristles of the dorsal series are long, slender, and finely tapered. A notch now separates the two divisions of the foot. The ventral lamella is also prominent and rounded, generally with a short peak. The modified bristles ventrally show a sharp and slightly hooked point (Pl. V. fig. 8), which under a high power is slightly dotted. No wings are visible in either dorsal or ventral bristles.

A fragmentary *Scolecocelis* (I), dredged in 35 fathoms amidst greyish sand, stones, and ooze in the 'Porepine' Expedition of 1869, shows certain novel features. The head is short, with a slightly bilobed anterior border, which forms the base of a triangle ending in a short subulate tentacle posteriorly. No eyes are visible in the preparation. A little behind the anterior edge of the snout ventrally are two prominent rounded peristomial papillæ in front of the mouth. The fragmentary body consists of about 16 segments, at the posterior end of which new segments and a tail are developing. It is flattened dorsally and grooved in the median line ventrally, whilst the sides are flanked by an extraordinary development of dull golden bristles, which at first sight makes an approach to the condition in *Euphrosyne*. A kind of flap, vertically elongated, occurs immediately behind the snout, but it does not appear to have either bristle or branchia. The first bristled foot carries a branchia and long tufts of bristles dorsally and ventrally; but the condition of the foot negatives a minute description. The bristles are of comparatively great length and strength, are finely tapered, and conform to the usual arrangement in *Scolecocelis*, the upper of the superior division being longest and curved upward and backward. No wings are visible. The bristles of the inferior division form a dense group shorter than the superior, and they are curved backward. Focussing indicated a margin on each side of the tapered tip, but no distinct wing is visible.

The great development of the superior lamella is soon conspicuous, and at the 10th foot (Pl. VI. fig. 9) it forms a large lanceolate crest on the dorsum, the outer or inferior edge being rounded, whilst the inner is acute. The branchia appears to be subulate and to stretch inward over the dorsum, but all had disappeared during the examination of the minute specimen. The remarkably dense, strong, and boldly curved dull golden bristles curve upward and backward, and narrow

wings are evident on the lower and many others in the division. The upper, as usual, are longer and more slender, but also present indications of wings. The ventral lamella is separated from the dorsal by a notch with a papilla, and is somewhat capstan-like, only the edges slope to a low cone in the centre. Its bristles curve downward and backward, taper to a fine point, and have narrow wings. Moreover, they are all minutely dotted or dappled, and many of the upper forms show a peculiar mark just below the tip, as if a portion had been scooped out. It is possible that friction may be connected with this appearance.

The condition of the posterior region is unknown, but at the 16th foot the superior lamella is still large and lanceolate, with a rounded outer or inferior margin, and the bristles have rather increased in length. The ventral lamella, however, is smaller and of the form of a short capstan. The bristles are also longer, and a ventral group of 4 or 5 larger, longer, and boldly curved bristles is differentiated, each tapering to a fine point, and the wings are more distinct.

A form dredged in the 'Porcupine' Expedition of 1870 in 45 fathoms off Cape Sagres is distinguished both dorsally and laterally by the structure of the snout, which is shaped somewhat like that of *Staurocephalus*, and thus differs from that of *Prionospio*. It has been termed *Kinbergella plumosa*, after the distinguished Professor in Stockholm, who has done so much to advance our knowledge of the marine annelids*.

Anteriorly, when viewed from the dorsum (Pl. V. fig. 9), two rather thick, flattened, anterior tentacles are separated by a median papilla, whilst the buccal segment gradually narrows to the base of a rounded bilobed papilla (like miniature *corpora albicantia*) on the dorsum behind. When seen from the front the anterior processes present a double foliate arrangement like the anterior end of certain mollusca, the mouth forming a median protuberance at the ventral edge. An arrangement of this kind is rare in the group. A kind of collar passes round the body at this region. The mouth opens immediately beneath the median papilla on the snout, and the lower lip, which has a slight cleft in the centre, is prominent, the aperture looking forward rather than ventrally. A projection exists on one side behind the papilla, but no palpi or tentacles are seen.

* Since this was written Prof. Kinberg has passed away, full of years and honours. His name will long and honourably be associated with the group.

Only a fragment of the anterior region of the body is present, comprising 17 or 18 bristled segments. It tapers a little anteriorly and is somewhat flattened both dorsally and ventrally, though the first part of the ventral surface is rounded, and a streak runs along the median line. The whole anterior region diverges from that of *Prionospio*.

Behind the bilobed dorsal papilla is a segment devoid of bristles, unless it is to be regarded as only an extension of the peristomium. Anteriorly it bears the bilobed papilla and the projection on the left side. It is followed by a region provided with 6 or 7 prominent lamellæ which partly overlap the dorsum, and from the narrowness of the region in front the first two or three approach each other more closely than those which succeed.

The first foot carries a broadly lanceolate dorsal lobe and a more pointed ventral lobe, the former overlapping the lateral region of the dorsum and the latter directed obliquely upward. The bristles of the dorsal division are curved backward, taper to a fine point, and the upper series is larger, as usual in the group. The ventral bristles have a similar structure, but are shorter.

The lamellæ reach their maximum about the 4th or 5th foot, projecting above the dorsum as large broadly lanceolate flaps. Moreover, the 4th foot bears a plumose branchia (Pl. VI. figs. 6 & 7) somewhat like a sea-pen. The base is smooth or slightly crenate, then the pinne appear and continue to the lanceolate apex, towards which they slightly diminish in size. As mounted, the broadest part of the organ is a little below the tip. The superior lamella is almost like that in *Phyllodoce*, overhanging the 5th as a broadly lanceolate leaf, and with the row of yellow bristles in front of it. The ventral lamella is smaller and somewhat conical.

No other branchia occurred in the example, but as the specimen is fragmentary the exact distribution of these organs is unknown. The absence of the long terminal filament so characteristic of *Prionospio* is noteworthy and does not appear to be due to any injury to the organ.

At the 10th foot (Pl. VI. fig. 8) the lamella has become a narrow rim with a bluntly conical free apex, and the bristles are shorter. The ventral lamella is narrow and short, rounded superiorly and inferiorly. One of the ventral rows of bristles is much more slender than the other, with very fine capillary tips. The bristles of the stronger row are broken, so that whether these have winged hooks is uncertain ;

but it is noteworthy that they and the 11th were all evenly broken about the same level.

The lamellæ become small before the 16th or 17th foot, sinking below the level of the dorsum as inconspicuous conical flaps. So far as observed, the simple dorsal bristles, which present no distinct wings, do not vary, but about the 16th foot the ventral series consists of a dense row of winged hooks with rather long shafts, which increase in diameter from below upward, bend backward, and slightly diminish to the throat (Pl. V. fig. 10), from which the sharp main fang comes off nearly at a right angle, and has three spikes on the crown above, the whole, however, quite differing from the hook of *Scolecoplepis vulgaris*. The wings are rather short and wide distally.

The specimen is a female, and large ovoid ova with the finely crenate capsule occurred as far forward as the 1st foot.

This form approaches *Prionospio* in certain respects, such as the plumose branchiæ and the massive form of the lamellæ.

The *Prionospio heterobranchia* of Percy Moore*, from Wood's Hole, Massachusetts, bears certain resemblances in the form of the snout, but the development of the lateral processes (tentacles?) of the snout in *Kinbergella* differs materially, and the branchiæ do not seem to possess the terminal filament, whilst the pinnæ or filaments of the gill are much shorter in the new form, which is also devoid of the conspicuous eyes. Yet the prostomium in *Prionospio heterobranchia* tapers to a point posteriorly and the hooks seem to be similar. *Kinbergella* therefore finds its nearest ally in *Prionospio*.

EXPLANATION OF THE PLATES †.

PLATE V.

- Fig. 1. Young *Gadus luscus*, 70 mm. in length. Twice the natural size.
- Fig. 2. Strong bifid hook-like bristle of the fifth segment of *Polydora quadrilobata*, Jacobi (var. *mesnili*). × Zeiss oc. 4, obj. D.
- Fig. 3. Dorsal bristle of same (5th) segment. × similarly.
- Figs. 4 & 5. Different views of the hook-like bristles of the 5th segment of *Polydora corazzi*. × Zeiss oc. 4, obj. D.
- Fig. 6. Ventral hook of the same species. × Zeiss oc. 4, obj. F.

* Proc. Acad. Nat. Sci. Philad. 1907, p. 195, pl. xv. figs. 1-6.

† I am indebted to the Carnegie Trust for the majority of the figures in both Plates.

- Fig. 7.* Imperfect head of *Nerinides (?) lamellata*, with the short proboscis extended. Enlarged.
Fig. 8. Ventral stiff bristles of the same. \times Zeiss oc. 4, obj. D.
Fig. 9. Anterior end of *Kinbergella plumosa*. Enlarged.
Fig. 10. Ventral hook from the 16th foot of the same species. \times Zeiss oc. 4, obj. D.

PLATE VI.

- Fig. 1.* Dorsal bristles of the 10th foot of *Nerinides lamellata*. \times Zeiss oc. 4, obj. D.
Fig. 2. Winged bristle of the dorsal division of the same foot. \times similarly.
Fig. 3. Ventral bristles of the 10th foot. \times similarly.
Fig. 4. 25th foot of the same species. \times similarly.
Fig. 5. 50th foot of the foregoing. \times similarly.
Figs. 6 & 7. Different views of the 4th foot of *Kinbergella plumosa*. \times 48 diam.
Fig. 8. 10th foot of the foregoing form. \times similarly.
Fig. 9. 10th foot of *Scolecopsis* l. \times about 34 diam.

XXI.—*Descriptions of Seventeen new Species and Varieties of Land and Freshwater Shells from East and West Africa and the Transvaal.* By H. B. PRESTON, F.Z.S.

[Plate VII.]

HAVING recently had through my hands a number of land and freshwater shells from the German Cameroons, and finding among them a number of forms which seem to have hitherto escaped notice, I venture to describe them in the present paper; at the same time I take the opportunity of describing two species of *Fischeria* from Senegal, collected in that region by Colonel M. Messenger, and two species of *Achatina* from E. Africa and the Transvaal respectively, as also a variety of *Achatina variegata*, Lk., from W. Africa, which, being constant and well-marked in form, I have thought worthy of a varietal name.

Gibbus (Edentulina) confusa, sp. n. (Fig. 1.)

Shell ovate-elongate, rather laterally compressed, thin, white, somewhat shining, semitransparent, rimate; whorls $5\frac{1}{2}$, sculptured with very fine oblique transverse lines, *very minutely but closely punctate* throughout, the latter portion of the last whorl somewhat ascending; sutures linear; columella descending obliquely above, excavated below, outwardly